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What is the Best Weight to Obtain Protective Mechanical Ventilation? – The Authors Reply

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We appreciate the interest of de Souza et al. (1) in our study on tidal volumes adjusted by ideal body weight (IBW) and outcomes in pediatric acute respiratory distress syndrome (PARDS) (2). They raise important questions regarding how IBW was calculated, the utility of IBW in underweight children, and the role of permissive hypercapnia.

First, regarding how we calculated IBW, we used two approaches. We used the Traub-Johnson equation in one approach (3), which is still commonly used for calculating IBW. However, we also used a body mass index (BMI)-based method, as suggested by de Souza et al. This method was termed the “IBW-BMI” in our manuscript, and is exactly the “reverse BMI” method suggested by de Souza et al, with the caveat that we used World Health Organization weight-for-length (instead of BMI) for patients < 2 years of age, as BMI is not validated in that age. Both methods yielded similar conclusions in our study.

Second, de Souza et al. raise an interesting point regarding underweight children. Underweight children would receive higher tidal volumes based on IBW compared to actual body weight (4). In our cohort, the prevalence of underweight was low (8%), whereas the percentage of overweight and obese children was high (33%). Additionally, we reiterate that in the primary analysis, tidal volume adjusted for *any* body weight was not associated with outcome. Thus, we did not perform additional analyses restricted to underweight children, although this may be useful in a cohort with different weight demographics. However, the converse hypothesis was tested, and consistent with de Souza et al.'s point, in the obese subgroup, we did see associations between higher tidal volume adjusted for IBW and worse outcomes.

De Souza et al. posit that patients in our cohort may have received high tidal volumes due to acidemia necessitating an increase in minute ventilation. Unfortunately, our study did not collect pH and CO₂ as part of its protocol. We worry that in a retrospective cohort, pH data would be inaccurate because of the incidence of metabolic acidosis and concurrent bicarbonate administration. Moreover, pediatric clinicians in practice rarely decrease minute

ventilation to allow a resulting acidemia that would be considered by some to be permissive (5).

Finally, as de Souza et al. point out, the PALICC definition did not exist for the entirety of our study, and given the more inclusive nature of the definition compared that of the Berlin, we likely failed to enroll patients with PALICC-defined PARDS. The recently completed multicenter PARDS Incidence and Epidemiology (PARDIE) study may also contribute to this literature (6), as it collected ventilator data in a subgroup of subjects and used the 2015 PALICC definition. We also agree that using imaging techniques such as electrical impedance tomography would be extremely useful in characterizing regional over-ventilation, rather than simply global tidal volumes or driving pressures, in PARDS.

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